

MARCH 13, 2024

Town of Arlington Conservation Commission
c/o Mr. Ryan Clapp, Conservation Administrator
Robbins Memorial Town Hall
730 Massachusetts Avenue
Arlington, Massachusetts 02476

**RE: Test Pit Summary Report
Thorndike Place Stormwater Peer Review**

Dear Members of the Arlington Conservation Commission,

On behalf of the Applicant, Arlington Land Realty, LLC, BSC Group, Inc. (BSC) is pleased to submit the attached Test Pit Summary Report summarizing results of work completed on May 18-19, 2023, under the supervision of the Town of Arlington's selected peer reviewer, Whitestone Associates (see also their report dated June 29, 2023).

The purpose of the test pits is to establish estimated seasonal high ground water (ESHW) levels to design effective stormwater infiltration systems in six locations. A 2-foot minimum separation between the ESHGW elevation and the bottom of the proposed infiltration system is required for in accordance with the Massachusetts Department of Environmental Protection's Stormwater Handbook (the Handbook).

The test pit work was performed to be wholly aligned with the conditions of the Comprehensive Permit issued by the Town of Arlington Zoning Board of Appeals. As such, it was conducted in full coordination with Town of Arlington officials including the Town Engineer, Wayne Chouinard, and the Commission's Agent, David Morgan. As detailed in the attached Test Pit Report, based on our coordination with Town staff, Whitestone was engaged by the Town to observe and document the test pits with BSC to meet the conditions of the Comprehensive Permit.

As there seems to be some level of confusion regarding the test pits performed, the results of these test pits, and the design of the stormwater management system, please note the following:

- The test pits were performed in May 2023, as per the conditions of the Comprehensive Permit. In accordance with the conditions and the Handbook, this is during the period of the year "when groundwater levels are likely to be highest."
- The eight (8) test pits were performed in the exact locations of proposed stormwater infiltration systems and these locations were submitted in advance for review and acceptance to Mr. Morgan and Mr. Chouinard. As previously stated, all test pit work was reviewed and witnessed by the Town's peer reviewer, Whitestone Associates.
- The Town's peer reviewer, Whitestone Associates, reviewed and wholly corroborated BSC's results in all eight test pit. There are no discrepancies or disagreements in the findings.
- Meaningful redoximorphic (redox) features were noted in three of the eight test pits by both BSC and Whitestone Associates. Whitestone Associates, the Town's peer reviewer, noted incomplete redox in one additional location (TP-7), but appropriately ignored these features with regard to ESHGW as they did not continue through the bottom of the test pit. Redox features indicating ESHGW levels were observed at elevations 3.63 in TP-3, 3.98 in TP-5, and 1.54 in TP-6.

- Groundwater was observed in the other five test pits at elevations from -0.24 (TP-7) to 2.5 (TP-8). This observed groundwater was lower than the redox features indicating ESHGW in almost all locations.
- Out of an abundance of caution and based on BSC's professional engineering experience, all proposed stormwater infiltration systems were designed conservatively using the highest observed ESHGW, based on the highest redoximorphic features found across the entire site, at elevation 3.98. Setting the bottom of each infiltration system at elevation 6.0 results in the required minimum 2-foot separation between ESHGW and bottom of infiltration in all cases. However, it must be noted that observed groundwater in most test pits was substantially lower than 3.98. Therefore, using an elevation of 4 is a conservative approach to design.
- BSC's conservative assumption of ESHGW was validated with a subsequent Frimpter Analysis (submitted previously on 2/28/2024) which showed predicted seasonal variation of ESHGW no higher than 3.98, below but in line with the design elevation of 4. Frimpter Analysis calculations were completed on the five test pits where redox features were not present. Frimpter Analysis predicted probable ESHGW from elevation 2 (TP-7, at site of large infiltration system) to elevation 3.91 (TP-1, at site of small infiltration system.) In no case did the Frimpter Analysis predict ESHGW higher than elevation 3.98 that was utilized in the design.
- All stormwater infiltration systems across the entire site are designed to be installed at elevation 6 insuring at least the minimum 2-feet required separation from ESHGW as specified by the Handbook.
- Hence, all requirements of the ACC, AZBA and most importantly the MA WPA have been conservatively addressed and met.

Please feel free to contact me at (617) 896-4386 or drinaldi@bscgroup.com should you have any questions on the information in this report.

Sincerely,
BSC GROUP, INC.



Dominic Rinaldi, PE
Senior Associate

Attachments: Test Pit Summary Report

TEST PIT SUMMARY REPORT

**THORNDIKE PLACE
DOROTHY ROAD
ARLINGTON, MA**

JULY 2023

Owner/Applicant:

ARLINGTON LAND REALTY LLC
84 Sherman Street, 2nd Floor
Cambridge, MA 02140

BSC Job Number: 23407.01

Prepared by:



803 Summer Street
Boston, MA 02127

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SECTION 1.0

PROJECT INFORMATION

1.01 PROJECT DESCRIPTION AND TEST PIT REQUIREMENTS

On November 22, 2021, the Town of Arlington Zoning Board of Appeals issued a Comprehensive Permit to Arlington Land Realty, LLC (Arlington Land Realty) under M.G.L. c. 40B, §§ 20-23, for a multi-family housing development consisting of twelve (12) ownership family homes, contained within six (6) duplex buildings together with 124 senior living residential apartments located within a single residential building off Dorothy Road in Arlington, Massachusetts. The total property area is approximately 17.66 acres and is located off Dorothy Road near the intersection with Littlejohn Street. The project is bounded on the north by Dorothy Road, on the east by residential properties and Thorndike Field, and bounded on the south and west by Concord Turnpike (Route 2).

The Project consists of clearing and grubbing of the northwest section of the property and construction of one 4-story residential building with a lower-level parking garage, six duplex townhouses with covered carports, as well as surface parking, walkways, utility services, and a stormwater management system. As part of the permitting of the Project, three (3) soil test pits were performed in November 2020 to determine soil types and estimated seasonal high groundwater (ESHGW) elevation for stormwater management design purposes.

As a condition of the Project, prior to construction, Arlington Land Realty was required to perform additional soil test pits for the purposes of confirming the 2020 test pits and ESHGW elevation in the exact locations of proposed stormwater infiltration systems to aid in their design. Specifically, Conditions C.2(k) and I.17 of the Comprehensive Permit required the following:

C.2(k) – Utilizing the methods detailed in Condition I.17, the Applicant shall perform additional test pits at the proposed stormwater basins to confirm groundwater elevations during seasonal high groundwater conditions as confirmed by monitoring nearby USGS wells. These test pits shall be witnessed by the Town and/or its agent. Should revisions to the infiltration system design be required based on additional groundwater investigations, revised plans and stormwater calculations will be provided to the Department of Planning and Community Development for review prior to the issuance of building permits.

I.17 – In addition to the provisions of Condition C.2.k, the Applicant shall, through documentation to be submitted to the Board for review, establish seasonal high groundwater elevations at the Property to ensure that there is a minimum of a two-foot separation between the bottom of the stormwater management infiltration chambers and the seasonal high groundwater table. The Applicant shall provide proposed locations and number of test pits and wells to the Board for review and administrative approval. Seasonal high groundwater shall be established based on Volume 2, Chapter 2: Structural BMP Specifications for the Massachusetts Stormwater Handbook, with specific requirements, as follows "Estimate seasonal high groundwater based on soil mottles or through direct observation when borings are conducted in April or May, when groundwater levels are likely to be highest. If it is difficult to determine the seasonal high groundwater elevation from borings or test pits, then use the Frimpter method developed by the USGS (Massachusetts/Rhode Island District Office) to estimate seasonal high groundwater. After estimating the seasonal high groundwater using the Frimpter method, re-examine the bore holes or test pits to determine if there are any field indicators that corroborate the Frimpter method estimate."

BSC Group, Inc. (BSC) was retained by Arlington Land Realty in March 2023 to perform the required test pits and ensure compliance with the referenced Comprehensive Permit conditions and aid in the design of the stormwater infiltration systems. This report summarizes BSC's work and the results of the test pit program.

1.02 TEST PIT LOCATIONS AND COORDINATION WITH TOWN

Based on the requirements of Condition C.2(k) and utilizing the approved site plans referenced by the Comprehensive Permit, it was determined that eight (8) additional test pits would be performed. One (1) test pit would be performed in each of the five (5) smaller underground infiltration systems associated with the duplex buildings closest to Dorothy Road, two (2) test pits would be performed in the large underground infiltration system adjacent to the 4-story residential building, and one (1) test pit would be performed adjacent to the bio-retention area east of the 4-story building. As TP-2 from 2020 was located approximately 6-feet from the large underground infiltration system, this test pit program would result in three (3) test pits in or adjacent to the large system and one (1) in each of the smaller systems and bio-

retention area. Based on the size of these systems, this program meets the Stormwater Standard 3 requirements of the Massachusetts Stormwater Handbook, Volume 3, Chapter 1 and the requirements of Conditions C.2(k) and I.17.

In accordance with the Conditions, BSC coordinated with the Town of Arlington to ensure that Town staff or a representative designated by the Town would be on site during test pit work to witness and confirm the results. BSC contacted Claire Ricker, Director of Planning & Community Development to coordinate a test pit witness for the Town and was referenced through Town Engineer, Wayne Chouinard to David Morgan, Environmental Planner and Conservation Agent. Mr. Morgan arranged to have a representative from Whitestone Associates on site to witness the test pits on May 18 and 19, 2023.

During the course of our coordination with the Town, Mr. Chouinard indicated that he would like to also have temporary groundwater monitoring wells installed during test pit excavation to allow for longer term measurements of groundwater on site. Based upon Mr. Chouinard's request, it was determined that three (3) wells would be installed at the locations of test pits TP-1, TP-6, and TP-7. These locations would allow for groundwater measurements across the full width and depth of the site and place them in three different types of infiltration systems (small, large, and bio-retention). Prior to test pit excavation, locations were field located utilizing a combination of GPS and swing ties from fixed points (utility poles, manholes, valve boxes, etc.) that had previously been located on the existing conditions survey for the project. Test pit and well locations are provided in Appendix B.

1.03 TEST PIT RESULTS AND COMPARISON TO 2020 RESULTS

On May 18 and 19, 2023, BSC oversaw the excavation of eight (8) soil test pits and the installation of three (3) temporary groundwater monitoring wells. These test pits were witnessed by a representative of Whitestone Associates on behalf of the Town of Arlington. In general, test pits consisted of varying depths of fill materials overlaying a parent material of fine sandy loam. Surface fill depths varied from 27 to 108-inches and generally decreased the further east the test pit was located. Test pit TP-8, located within the large underground infiltration system, was entirely fill material to a depth of 120-inches.

Standing and/or weeping groundwater was found in all test pits at depth varying from 60 to 112-inches below existing grade. Additionally, redoximorphic (redox) features, indicating the presence of seasonal high groundwater, were observed in three of the test pits – TP-3, TP-5, and TP-6. These redox features were found at depths between 48 and 64-inches below existing grade. The table below summarizes the test pit results. Where redox features were observed, these have been used to identify ESHGW elevations. Where no redox features were observed, the depth to observed groundwater has been used to identify ESHGW elevations.

Test Pit	Existing Grade	Total Depth (in.)	Depth Fill (in.)	Depth Observed GW (in.)	Depth to Redox (in.)*	ESHGW
TP-1	10.66	120	90	108	n/a	1.66
TP-2	8.79	104	83	97	n/a	0.71
TP-3	7.88	87	27	82	51	3.63
TP-4	7.08	96	64	68	n/a	1.41
TP-5	7.98	74	33	60	48	3.98
TP-6	6.87	132	30	110	64	1.54
TP-7	8.92	114	108	110	n/a	-0.24
TP-8	11.83	120	120	112	n/a	2.50

*Test pits with "n/a" in Depth to Redox column indicate locations where no redoximorphic features that would indicate an estimated seasonal high groundwater were observed.

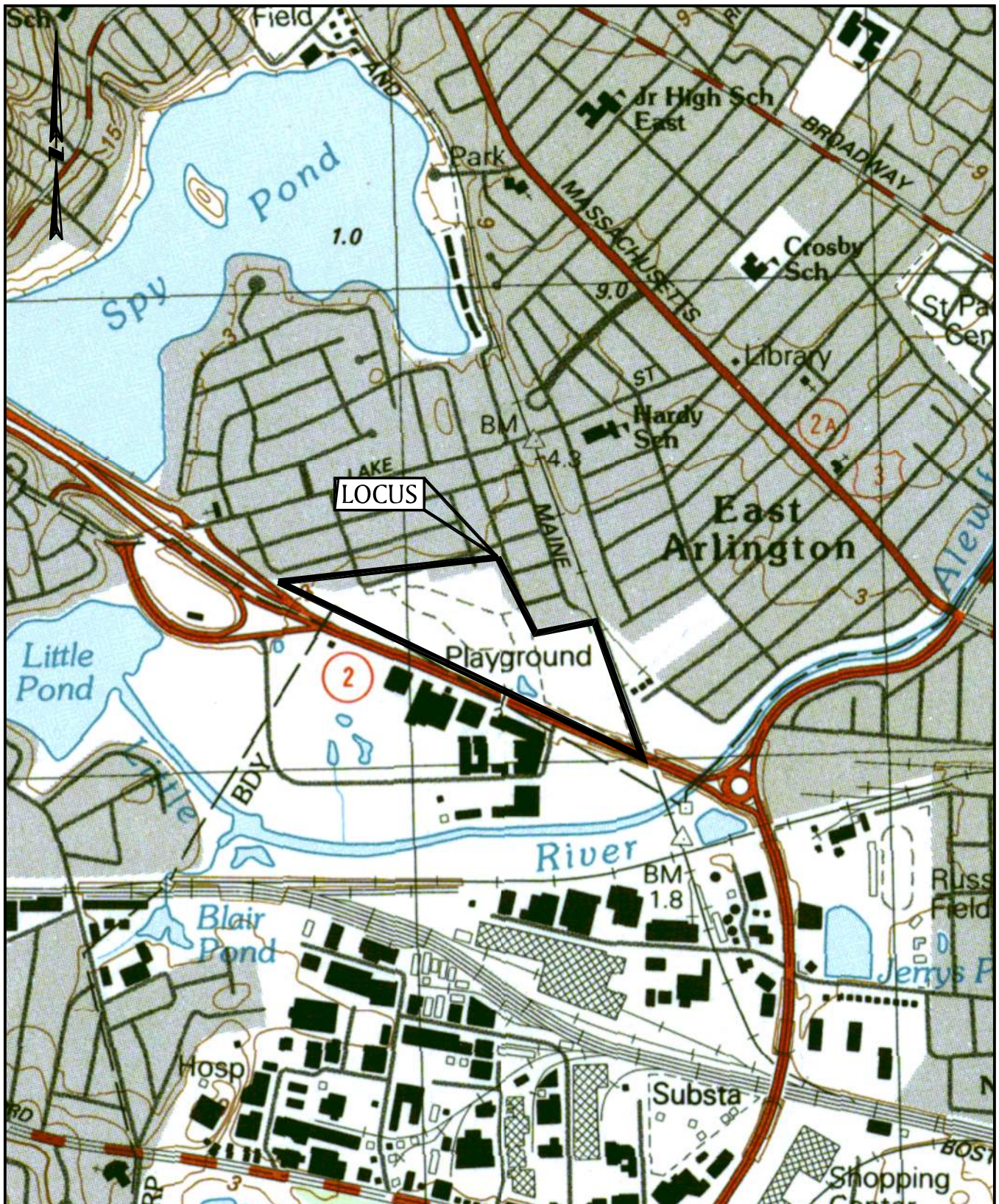
Test pit logs are provided in Appendix C and photos are provided in Appendix D.

In general, the test pits conform to the test pits performed in November 2020. Test pits 1 and 2 from 2020 were in the western portion of the site (generally in the vicinity of TP-1 and 8 in 2023) and showed similar depths of fill and depths to standing water or weeping from the pit face. Test pit 3 in 2020 was generally further back from the street and approximately mid-way between 2023 TP-6 and TP-7. As such, it appears to be an outlier with regard to soils observed. As TP-3 in 2020 was the only test pit where redox features were observed and these features were lower than observed groundwater in the other two test pits, ESHGW for the 2020 design was based on observed water elevations. The ESHGW generally ranged between elevations 0 and 3, and the system was designed to the most conservative ESHGW elevation (3.0 as found in TP-1) observed in 2020. As shown in the table above, the highest ESHGW elevation from the 2023 test pits is 3.98 at TP-5. As shown on the approved plans, the primary infiltration system has a bottom elevation of El. 6; the confirmatory testing performed in 2023 supports the appropriateness of that primary infiltration system as designed. With respect to the smaller infiltration systems along Dorothy Road, supporting the townhouse units, the lowest elevation of those smaller systems is El. 5.5. Based on the results of the recent test pit analysis, i.e., Test Pits 3 and 5, a slight adjustment to the design of the small infiltration systems was made resulting in the stone bottoms of the infiltration systems be slightly adjusted from El. 5.5 to El. 6.0, maintaining the required 2 feet of separation per the DEP Stormwater Standards. Likewise, to account for such raising the height of the bottom of the systems, the height was correspondingly decreased and a minor increase in the footprint was provided. Such adjustments do not change the overall stormwater management design or the calculations; these small infiltration systems as well as the overall stormwater management design will function consistently as the design submitted, peer reviewed, and approved under the Comprehensive Permit.

1.04 CONCLUSIONS

In accordance with Conditions C.2(k) and I.17 of the November 22, 2021, Comprehensive Permit for the Project, BSC performed eight (8) additional soil test pits and installed three (3) temporary groundwater monitoring wells. This work was witnessed by a representative of the Town of Arlington as required by the Conditions. The results of these test pits were generally consistent with the test pits previously performed in November 2020. Based on these test pit results, specifically TP-5, a slight adjustment to the bottom of the small townhouse infiltration systems was made. This slight adjustment does not result in any significant changes to the stormwater management system design or the previously approved calculation results. In sum, all infiltration systems with a bottom elevation of 6.0, will be located at least the minimum two feet above the highest ESHGW found across the site but in many cases with greater separation based on May 2023 findings witnessed by the Town's representative, Whitestone Associates.

APPENDIX A
USGS LOCUS MAP




PREPARED FOR:

ARLINGTON LAND REALTY, LLC
 84 SHERMAN ST, 2ND FLOOR
 CAMBRIDGE, MA 02140

USGS LOCUS MAP

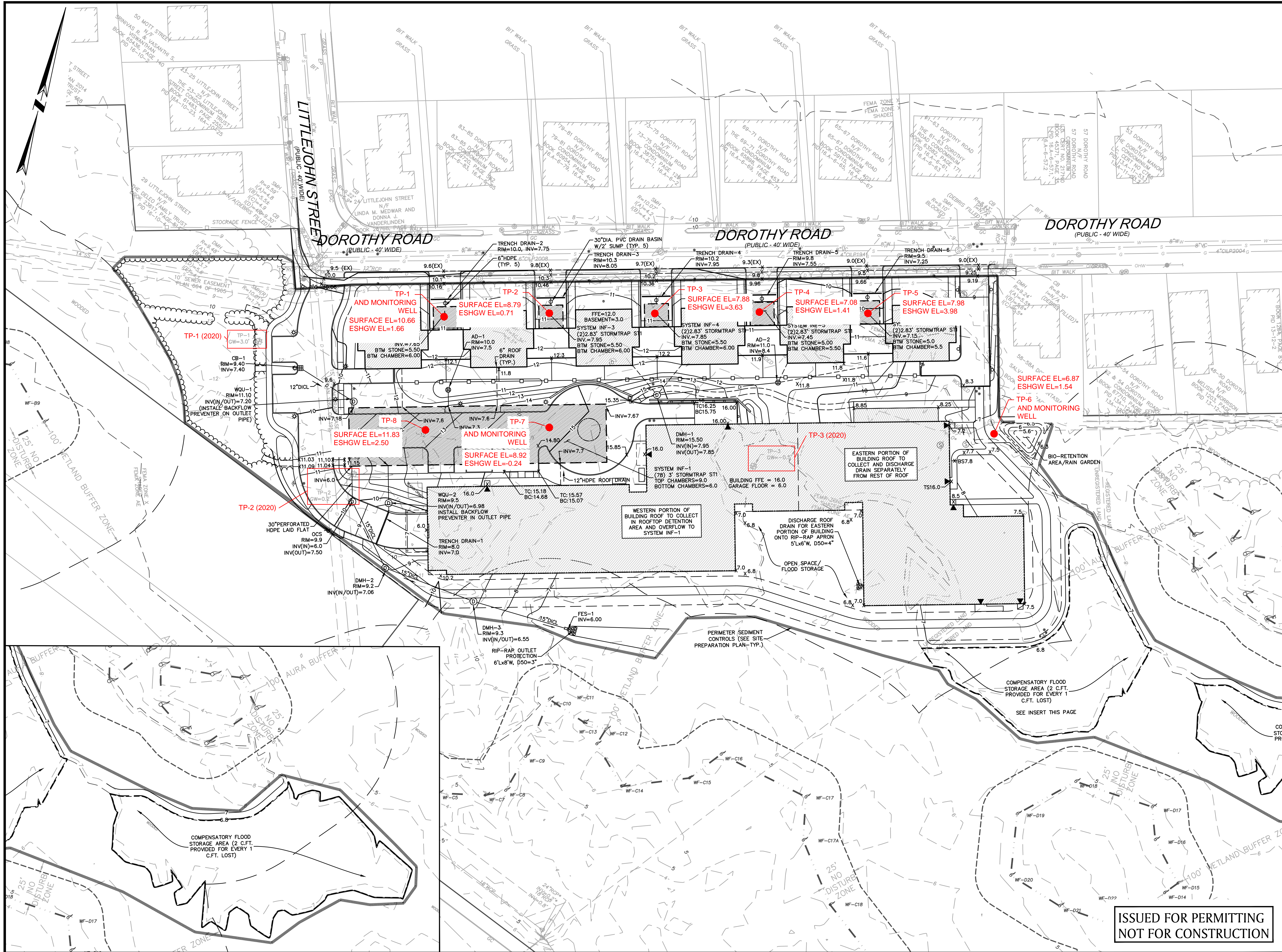
THORNDIKE PLACE
 DOROTHY ROAD
 ARLINGTON, MA


BSC GROUP
 803 Summer Street
 Boston, Massachusetts
 02127
 617 896 4300

Job No.: 23407.00	Date: 11/3/2020
Scale: 1"=1,000'	Revised:
Dwg. No:	Figure: 1 OF 1

APPENDIX B

TEST PIT MAP



THORNDIKE PLACE

DOROTHY ROAD
IN
ARLINGTON
MASSACHUSETTS
(MIDDLESEX COUNTY)

GRADING & DRAINAGE PLAN

MARCH 13, 2020

REVISIONS:		
NO.	DATE	DESC.
1	9/18/20	NEW BUILDING FOOTPRINT
2	10/22/20	WETLAND DELINEATION
3	11/03/20	REVISED BUILDING
4	3/11/21	LAYOUT REVISIONS
5	5/10/21	NEW BUILDING FOOTPRINT
6	6/3/21	NEW BUILDING GRADING
8	8/27/21	FULL PLAN SET

PREPARED FOR:
ARLINGTON LAND REALTY, LLC
84 SHERMAN STREET, 2ND FLOOR
CAMBRIDGE, MA 02140

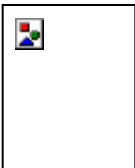
BSC GROUP
803 Summer Street
Boston, Massachusetts
02127
617 896 4300

© 2021 BSC Group, Inc.
SCALE: 1" = 30'
FILE: \\Civil\\Drawings\\2340700-GR
DWG: SHEET C-104
JOB. NO: 23407.00

ISSUED FOR PERMITTING
NOT FOR CONSTRUCTION

APPENDIX C

TEST PIT LOGS



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Arlington Land Realty, LLC.

Owner Name

Dorothy Road

Street Address

Arlington

City

MA

State

16-8-2, 16-8-3, 16-8-4, 16-8-5, 16-8-6, 16-8-7A

Map/Lot #

02474

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey NRCS USDA Web Soil Survey

Source

655

Soil Map Unit

Udorthents, wet substratum

Soil Series

Depressions

Landform

Soil Limitations

Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Soil Parent material

3. Surficial Geological Report

2018/USGS

Year Published/Source

Artificial fill, glaciomarine fine deposits, stagnant ice deposits

Map Unit

Fine/very fine sand down to very fine sand, silt, silty clay, and clay

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

If yes, MassGIS Wetland Data Layer:

Wetland Type

7. Current Water Resource Conditions (USGS):

Month/Day/ Year

Range: ☐ Above Normal

☐ Normal

☐ Below Normal

8. Other references reviewed:

(Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Not in Zone II or IWPA (MassMapper)



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-1 5/18/23 9:00AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 3%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 32' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression SU
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 280 feet
Property Line 22 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 108" Depth to Weeping in Hole 114" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-90	Fill	Sandy Loam	7.5YR 3/2		Cnc : Dpl:		0	4-6	Massive	Friable	
90-120	C	Fine Sandy Loam	7.5YR 5/2		Cnc : Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Top of monitoring well 3'-8" from ground surface



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-2 5/18/23 1:30PM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 2%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 30' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression BS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 270 feet
Property Line 22 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: _____ Depth to Weeping in Hole 97" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-83	Fill	Sandy Loam	10YR 3/2		Cnc : Dpl:		0	4-6	Massive	Friable	
83-104	C	Fine Sandy Loam	10YR 5/1		Cnc : Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Shifted back a few feet because of boulder or buried piece of debris

Seemed like there may have been a second layer of sandy material below the point where groundwater broke into the hole



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

☐ Depth to soil redoximorphic features

☒ Depth to observed standing water in observation hole

☐ Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology)

Obs. Hole # TP-1

_____ inches

108 inches

_____ inches

Obs. Hole # TP-2

_____ inches

97 inches

_____ inches

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?

Upper boundary: _____

inches

Lower boundary: _____

inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____

97

inches

Lower boundary: _____

104

inches



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-3 5/18/23 2:30PM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 6%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 32' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression BS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 280 feet
Property Line 22 feet Drinking Water Well >100 feet Other feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: Depth to Weeping in Hole 82" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-27	Fill	Sandy Loam	10YR 2/2		Cnc : Dpl:		0	4-6	Massive	Friable	Buried A layer at 21"
27-87	C	Fine Sandy Loam	10YR 4/3	51"	Cnc : 7.5YR5/8 Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-4 5/19/23 8:15AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 6%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 30' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression TS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 310 feet
Property Line 24 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 68" Depth to Weeping in Hole 72" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-64	Fill	Gravelly Sandy Loam	7.5YR 3/1		Cnc : Dpl:		10-15	2-4	Massive	Friable	
64-96	C	Fine Loamy Sand	10YR 4/2		Cnc : Dpl:		2-4	0	Massive	Very Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

☒ Depth to soil redoximorphic features

Obs. Hole # TP-3

51 inches

Obs. Hole # TP-4

_____ inches

☒ Depth to observed standing water in observation hole

82 inches

68 inches

☐ Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology)

_____ inches

_____ inches

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?

Upper boundary: _____

inches

Lower boundary: _____

inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____

68
inches

Lower boundary: _____

96
inches



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-5 5/19/23 10:30AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 10%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 35' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression BS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 230 feet
Property Line 24 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 60" Depth to Weeping in Hole 60" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-33	Fill	Gravelly Sandy Loam	10YR 3/2		Cnc : Dpl:		10	4-6	Massive	Friable	Buried A layer at 26"
33-74	C	Fine Sandy Loam	10YR 5/2	48"	Cnc : Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:



Commonwealth of Massachusetts
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Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-6 5/19/23 9:00AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 5%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 120' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression TS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 110 feet
Property Line 12 feet Drinking Water Well >100 feet Other feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 110" Depth to Weeping in Hole 110" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-30	Fill	Gravelly Sandy Loam	7.5YR 3/2		Cnc : Dpl:		10-15	4-6	Massive	Friable	
30-132	C	Fine Sandy Loam	10YR 5/2	39"	Cnc : 7.5YR5/8 Dpl:		0	0	Massive	Friable	
				64"	Cnc : 7.5YR5/8 Dpl:						Second redox band - calling ESGW here
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Multiple redox bands in C horizon
Top of monitoring well 1'-8" from ground surface



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

☒ Depth to soil redoximorphic features

Obs. Hole # TP-5

48 inches

Obs. Hole # TP-6

64 inches

☒ Depth to observed standing water in observation hole

60 inches

110 inches

☐ Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology)

_____ inches

_____ inches

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?

Upper boundary: _____

inches

Lower boundary: _____

inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____

60
inches

Lower boundary: _____

74
inches



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-7 5/18/23 11:00AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 3%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 110' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression BS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 190 feet
Property Line 100 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: _____ Depth to Weeping in Hole 110" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-108	Fill	Gravelly Sandy Loam	7.5YR 3/1		Cnc : Dpl:		10	4-6	Massive	Friable	
108-114	C	Fine Sandy Loam	5Y 5/1		Cnc : Dpl:		0	0	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes: Sand layer was completely saturated
Top of monitoring well 4'-6" from ground surface



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Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP-8 5/18/23 10:00AM Clear 42.4' N 71.2' W
Hole # Date Time Weather Latitude Longitude

1. Land Use Wooded lot in residential area Trees Some surface stones, not many 4%
(e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: At the front of the site along Dorothy Road, about 110' in from the edge of the road

2. Soil Parent Material: Glaciofluvial deposits Depression TS
Landform Position on Landscape (SU, SH, BS, FS, TS, Plain)

3. Distances from: Open Water Body >100 feet Drainage Way >100 feet Wetlands 210 feet
Property Line 98 feet Drinking Water Well >100 feet Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 112" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-120	Fill	Gravelly Sandy Loam	7.5YR 3/1		Cnc : Dpl:		10	4-6	Massive	Friable	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

☐ Depth to soil redoximorphic features

Obs. Hole # TP-7

_____ inches

Obs. Hole # TP-8

_____ inches

☒ Depth to observed standing water in observation hole

110 inches

112 inches

☐ Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology)

_____ inches

_____ inches

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☐ Yes ☒ No

b. If yes, at what depth was it observed (exclude O, A, and E Horizons)?

Upper boundary: _____

inches

Lower boundary: _____

inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____

120
inches

Lower boundary: _____

120
inches



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

Emily Derrig, SE 14158

Typed or Printed Name of Soil Evaluator / License #

5/22/2023

Date

6/30/2023

Expiration Date of License

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:

APPENDIX D

TEST PIT PHOTOS



TP-1 at full depth



TP-1 with standing water at bottom



Installation of monitoring well at TP-1



Completed monitoring well at TP-1



TP-2 at full depth



TP-2 with standing water at bottom



TP-3 with standing water at bottom



TP-3 with standing water at bottom. Note redoximorphic features on side wall.



Soil pile from TP-3. Note redoximorphic features in soils.



TP-4 with standing water at bottom



TP-5 with standing water at bottom. Note redoximorphic features on side wall.



TP-5 with standing water at bottom. Note redoximorphic features on side wall.



TP-6 with standing water at bottom. Note redoximorphic features on side wall.



TP-6 monitoring well installation. Note redoximorphic features on side wall.



Completed monitoring well at TP-6



TP-7 at full depth



TP-7 with standing water at bottom



Completed monitoring well at TP-7